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MONITORING AND COLLUSION: "CARROTS" VERSUS "STICKS" IN THE CONTROL OF AUDITORS

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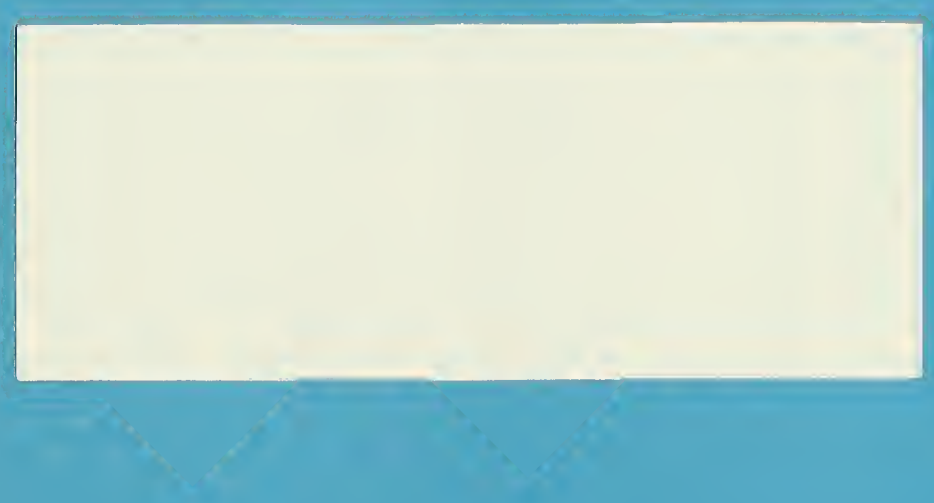

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JEL Classification: D23, L22
Keywords: monitoring, collusion, implicit collusion, career concerns, the threat of lawsuits

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MONITORING AND COLLUSION :

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Abstract

Monitors can be useful to the principal in controlling the agent. However, in such an hierarchical organizational, monitors will also have an incentive to collude with the agent. We consider a static model where an auditor is hired to monitor an empire building manager. We start by allowing unrestricted and enforceable side-contracting between the manager and the auditor. While this model predicts that the auditor's fees should be contingent upon her report, in practice auditors are largely controlled by the threat of lawsuits rather than direct incentives. A static model does not fit this observation nor the established view of the imperfectness of the auditors' independence. It is also unable to answer a number of interesting questions about collusion. We therefore offer a theory of *implicit collusion* where the auditor conceals information because of her *"career concerns"* which arise from the expectation of future rents. This dynamic model predicts that the "stick" of the law combined with a flat fee is a more effective method of control than bonuses. We also show that market structure matters for organizational form, a large scope for monitors may facilitate implicit collusion and that an interesting multiplicity of equilibria is possible. Overall we argue that it is more realistic and informative to explicitly model the forces that may maintain collusion as an equilibrium.

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1) Introduction

In most organizations, agents are not the residual claimants of the returns they generate. This conflict of interest between the residual claimant (the principal) and the agent is often resolved by an incentive contract. Nevertheless, the inability of the principal to perfectly monitor the agent is costly. In many situations a third-party is introduced to monitor the agent; foremen on the factory floor (Calvo and Wellisz (1979), auditors (Antle (1982,1984)), regulation agencies (Baron and Besanko (1984)), the judiciary system (i.e. separation of powers) can all be seen to fit this picture since one of their major roles is to monitor an agent on behalf of another party. However, as discussed by Tirole (1986), in such an hierarchical control structure, the monitor will have an incentive to make side deals with the agent. Thus, the principal has to make collusion unattractive for the monitor and the agent (see for instance Kofman and Lawaree (1993a), Laffont and Tirole (1993), Felli (1993), also see multi-agent contracting models such as Holmstrom (1982), Demski and Sappington (1983), Mookherjee (1984), Ma et al (1988), Holmstrom and Milgrom (1990), Laffont (1990) to name a few). The study of monitoring and collusion poses a number of important problems. First, what will the contract of the monitor be like? In practice, we seldom observe monitors being given direct incentives or being paid according to the performance of the agent; rather most monitors have legal obligations to the principal and are threatened by lawsuits[1]. Do our theories predict this reliance on "sticks" rather than "carrots"? Second, since legal control appears to be important in practice, are the legal regulations we observe optimal in any sense? Third, Tirole (1986), following Crozier (1963) and Dalton (1959), gives many examples of actual collusion. Do our theories imply that collusion restricts the set of contracts that can be used in equilibrium or does it also take place such that in equilibrium, monitors conceal valuable information? Fourth, since collusion is often illegal, how do restrictions on explicit side-contracting impact on collusion? Can collusion take place without explicit and enforceable side-contracts and if so, what are the conditions necessary for such *implicit collusion*? Fifth, should monitors just monitor or can other tasks be delegated to them? Sixth, should monitors be subordinated to the agent or be his superior? Seventh, how does the structure of market for monitors impact on equilibrium organizational form?

To offer some answers to these questions, we will consider a simple organization; an

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[1] What distinguishes legal punishment from direct incentives is that instead of the performance of the firm, the payment of the monitor is conditional on the decision of a court.

auditor is hired to monitor the manager who has conflicting interests with those of the shareholders (as in Antle (1982) or Kofman and Lawaree (1993a) to name a few precedents). One of our main aims in this paper is to partially open the black-box of collusion. We will thus make use of the institutional details relating to auditors. Nevertheless, most of our analysis is applicable to other monitoring relationships. An important factor in managers' ability to pursue goals other than those of the owners is the extent to which he possesses more information about the corporation, therefore the *attestation* of the manager's reports can be valuable and an auditor may be hired for this purpose. We will thus consider a hidden information principal-agent model but the qualitative features of our results would also translate to a hidden action model where the auditor would report about the effort level of the manager.

We will first consider a static setting with unrestricted side-contracting between the manager and the auditor. This model predicts that the auditor should not be paid according to the performance of the firm and that her rewards should be based on her reports. The possibility of legal punishment is counter-productive when the monitor can conceal both favorable and unfavorable evidence. In the case where she can only conceal bad evidence, we can derive a role for legal punishment but this role is quite limited. Although it can be argued that monitors' reputation thus their future payments depend upon their previous reports (i.e. whether they "blow-the-whistle" on bad projects), the predictions of this model do not seem to adhere well with the observation that most monitors are regulated by law or disciplined by the threat of being fired. Further such a static model is not well-suited to answer the other questions posed above; for instance, since unrestricted contracts are possible, the scope of the monitor's other duties or whether she is the agent's subordinate or his superior are irrelevant for collusion.

We will therefore argue that a dynamic model is needed. Tirole (1986), following Williamson (1975), suggests that long-term relationships are more conducive to collusion and also emphasizes the concept of reciprocity from Gouldner (1961), while lawyers and auditors emphasize the importance of career concerns as a threat to auditor independence[2] rather than the

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[2] Gormley (1981), Chapter 3, DeAngelo (1981). In particular, Dunn (1991), p.20, "It is impossible to overcome the fact that auditor receives a fee for the audit. This creates an immediate and pressing need for him to make sure that he does not endanger this source of income.". Schandl (1978) goes even further; "It is interesting to observe the hypocrisy of the professional accounting bodies and the security exchange regulations dealing with the problem of independence... Ownership of a share by the auditor, by his wife, by his partner or by the employer of the auditor disqualifies him from rendering an opinion. But they close their eyes

presence of explicit bribes. However, if side-contracts were unrestricted and enforceable, there would be no reason to expect a difference between the short and the long-term. It is thus useful to open the black-box of long-term relationships. With this aim, we develop a theory of *implicit collusion*. Auditors cannot sign a side-contract with the manager, and yet they receive rents in their relationship with the firm. Therefore to be reemployed (i.e. due to their *career concerns*), they may find it profitable to conceal some useful information. For this to be an equilibrium, the manager must have a credible threat to fire the auditor and the firing of the auditor should not be interpreted as a bad signal by the shareholders. Our analysis will derive the exact conditions for such an implicit collusion equilibrium to exist and relate these conditions to the questions posed in the opening paragraph. An alternative approach to collusion in the absence of enforceable side-contracts would be based on reputation and cooperation in repeated games applying ideas developed by Kreps et al (1982), Cremer (1986) or Fudenberg and Levine (1989), see Tirole (1990)). In this paper, we have chosen an approach based on the credibility of threats because it is simpler to analyze, leads to clear predictions and emphasizes institutional determinants of collusion.

Our model of implicit collusion also offers a number of new insights. First, the less competitive is the audit market, the more likely is collusion. Second, in our model, the possibility of collusion does not only restrict the pay-off set of the shareholders but may lead to some valuable information being concealed. Third, since the firing of the monitor should not be interpreted as too bad a signal by the shareholders, for implicit collusion to be possible there needs to be other reasons for which auditors could be fired. Thus, as we delegate additional tasks to auditors, we would be making collusion easier. Further, because the threat to be fired (career concerns) are important, collusion is more likely when the monitor is subordinated to the agent and when she has less authority. Fourth, the conditions that make implicit collusion possible also imply that the legal punishment is a more effective form of control than bonuses. This is because the auditors must be earning rents for implicit collusion equilibrium to be possible, and while bonuses will increase these rents, legal punishment would potentially

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and try not to see the problem of much greater importance: the threat of losing the client if the client dislikes the auditor's opinion". Also, the accounts of Crozier (1963) and Dalton (1959) correspond much more closely to a situation in which the career concerns of the monitors are the key reason for their compromise. The importance of reemployment concerns are also discussed in Acemoglu and Gietzmann (1993).

decrease them. Optimal control may thus involve a flat fee and the threat of punishment. As a result, in contrast to the static problem with unrestricted side-contracting, a dynamic theory of collusion based on career concerns predicts the form of control that we observe in practice. Finally, in a model of implicit collusion, the optimal behavior of a monitor may depend on how other monitors are expected to behave, hence a multiplicity of equilibria arises. However, this multiplicity is different in nature than the large number of equilibria in repeated games. It arises because the credibility of the manager's threats depend on the actions of other auditors.

The recent paper by Kofman and Lawaree (1993a) also analyzes how the possibility of collusion constrains the set of possibilities for shareholders. Nevertheless, they do not deal with the interaction between private contracts and litigation nor do they analyze the possibility of implicit collusion, assuming that binding side-contracts can always be written. While we show that the risk-aversion of auditors may be important for the mix of controls that will be used by shareholders, Kofman and Lawaree assume risk-neutrality. The seminal paper by Tirole (1986) does not discuss nor formally model implicit collusion, although it emphasizes the importance of long-term relationships and reciprocity[3]. Tirole also studies whether the agent is likely to be punished or rewarded as a result of the monitor's report but does not discuss why we do not see direct incentives in monitoring contracts. Finally, by developing a model of implicit collusion, our paper obtains a number of new results such as the possibility of multiple equilibria depending on other auditors' behavior, the link between market structure and organizational form, and the importance of the scope of the monitor's duties and of her authority.

The paper is structured as follows. In section 2, we present a model in which, without the possibility of collusion, auditing has a welfare increasing role for shareholders. In Section 3 we develop a simple model that enables us to study monitoring and collusion in the presence of enforceable side contracts and investigate the role of a range of instruments ("carrots" and "sticks") in controlling the extent of collusion. Section 4 constitutes the most important part of the paper. It develops a model for the analysis of collusion in the absence of enforceable side contracts and discusses the questions posed above. The paper concludes with Section 5 while an appendix contains the proofs.

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[3] Tirole's more recent paper (1990) contains a model where collusion may arise in a repeated game framework, but this is different from the model considered here due to the reasons discussed already.

2) Auditing Without Collusion: The Basic Framework

Consider a manager running a firm on behalf of a group of risk-neutral shareholders who only care about final returns. At date t=1, a continuation decision has to be made. Either the assets of the corporation will be liquidated at a value L or the project will continue[4]. Therefore, shareholders only want the project to be continued if expected returns are greater than L. We assume that there are two states of nature, good (g) and bad (b) which are expected to occur with probability p and 1-p respectively. In state i (i = g or b), the project has a chance of success equal to q_i with associated return equal to y. If unsuccessful, returns are equal to zero. It is assumed that

(C1) $$q_g y > L > q_b y$$

thus shareholders would only like to continue in the good state. Also

(C2) $$pq_g y + (1-p)q_b y > L$$

so when they have no information about the true state of the world, it is not profitable for the shareholders to discontinue the project. Since shareholders are disperse, they do not have sufficient incentives to invest time and resources in investigating the accounts of the company and will not observe the true state of the world directly. Nevertheless, before the continuation decision, they receive a summary financial statement from the manager, reporting whether the company's performance was good or bad in the most recent period, i.e. whether the state is good or bad. This report may or may not be truthful. The sequence of events in this model is summarized in Figure 1.

The manager has interests that differ from those of the shareholders. Specifically, he receives control rents from continuation and would like to undertake the project in both states of nature (e.g. Baumol (1959), Williamson (1964)). This problem could in general be solved if the manager is offered an incentive contract based on the returns of the company. However, such incentive schemes are often expensive and introduce inefficiencies. To capture this idea in a very simple way we adopt the assumption of Hart and Moore (1990): the manager is an absolute empire builder in the sense that he derives infinite control rents from continuation. This

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[4] As the shareholders are disperse, an alternative interpretation is that each shareholder decides what their reservation price for the shares is and if this price is sufficiently low, a raider takes-over and liquidates the company. Shareholders will also have other methods of control than auditing such as debt, incentive contracts, threat of takeover, etc. However, in general these methods only work imperfectly and as it can be verified quite simply, in our case they do not work at all.

assumption of unidimensional preferences for the manager considerably simplifies our analysis by implying that there exist no contract or mechanism that will insure truthful reporting by the manager to shareholders. Given this specification we can state the following result.

Proposition 1 (Overoptimistic Managerial Reporting)
The manager will always report the state of nature to be good and the project will be continued.

This outcome is obviously inefficient from the viewpoint of the shareholders and it can be asked whether another agent attesting the validity of the report of the manager would help (See Gormley (1981) Chapter 4 and Mednick (1986) on the role of auditors to attest reports and also to make financial forecasts). Let us suppose that at t=0 an auditor is hired who also studies the accounts of the firm and if the manager prepares an overoptimistic financial report, the auditor discovers this with probability 1-r. We can think of this situation as follows; after performing sample audit work, the auditor receives a signal about whether the state of nature is B or G. The probability that the project is good conditional on message B, denoted by P(B), is equal to zero. The probability that the project is good conditional on signal G, denoted by P(G), is $\frac{p}{p+(1-p)r}$. Therefore even when the auditor finds no sign of overoptimistic reporting, the state of nature may be bad. Since auditors decide how thoroughly to investigate the accounts, r is in general endogenous. Assuming r constant will not however change the main features of our paper. Note also that since there is a positive probability, r, that the auditor will not discover the state of nature to be bad, the manager will always issue a good report and nothing would change in our analysis if the auditor were hired at t=1, after the report of the manager instead of at t=0.

We can summarize the decision of the auditor with a function a(.) which maps her signal into a report. Our task is to determine a(B) and a(G). Let us start with the case where the auditor always behaves truthfully (the extreme case of auditor independence in which the auditor has no desire to collude with the management) which would entail a(B)=B and a(G)=G irrespective of her rewards. As a result, if an auditor is hired, whenever the state of nature is bad and she discovers it, she will save the shareholders the difference between the expected return of the project and the liquidation value. Thus the benefit to shareholders of hiring an independent auditor is equal to $(1-p)(1-r)(L-q_b y)$. If this amount is greater than the cost of auditing, shareholders would hire an auditor and discontinue the project whenever she claims

the manager has produced an overoptimistic report, i.e sends message B. In what follows we will assume this gain to be large. Thus shareholders will hire an auditor to solve the incentive problem. This result is of course not surprising as we know that introducing a third-party is helpful in a number of situations (e.g. Vickers (1985), Fershtman and Judd (1987) or Katz (1991)). However, the crucial issue here is how to ensure the independence of the auditor while also minimizing the cost of control to shareholders.

3) Collusion, Control of the Auditor and the Role of Legal Institutions

In this section we will relax the assumption that auditors can be automatically relied upon not to collude with the management. Instead we will analyze a situation in which there are no restrictions on side-contracting between the manager and the auditor and such side-contracts will not suffer from enforceability problems. We will also assume that the manager can pay a maximum bribe equal to m and model this as a monetary bribe. In general, managers can also reward the auditor in other ways too; for instance by cooperating with them, by making their financial records easily available, etc. Although these show similarities to the reciprocity idea mentioned in the introduction, we interpret the bribe as a monetary one in this section, because the more interesting cases need a dynamic framework like the one we introduce later.

The audit market is competitive and the auditor receives her reservation return denoted by u^*. This is a very important assumption in comparing the relative efficacy of different instruments as it enables us to impose the participation constraint of the auditor and treat the problem a constrained cost minimization[5]. In the next section, collusion will require auditors to receive rents and additional issues will arise. The total cost to shareholders will depend on the utility function of the auditor and the variability in her returns. We assume that the auditor is risk-averse with a utility function u(.). Risk-aversion is a plausible assumption: since most audit firms face the risk of large lawsuits, they are unlikely to act in a risk-neutral way.

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[5] Although in practice auditors are hired and incentive contracts are determined by managers, we treat the problem as though shareholders hire the auditor. The justification is that if the manager does not hire an auditor or does not sign a collusion-proof contract with her, the shareholders will either not hire the manager or will decide to liquidate the project. This stage can be explicitly modelled by giving the manager a choice to hire an auditor and offer her an observable contract after he finds out about the state of nature and then impose a signalling refinement such as Cho and Kreps (1987)'s Intuitive Criterion. This is not done in the paper so as not to crowd the argument even further (for a similar structure see Acemoglu (1993)) but all our results can be shown to hold with this modification.

We model the legal system as follows. If the auditor does not find the report of the manager overoptimistic (i.e. reports a good state) and subsequently zero returns are realized, shareholders can file a lawsuit against the auditor for not defending their interests. This modelling assumption is intended to resemble the following stylized facts. Shareholders do not observe whether auditors have performed effective audits. However, if the investment collapses (makes zero returns) shortly after a favorable report of previous performance from the auditor, shareholders believe that there is a high probability that auditors performed inadequately (see Gormley (1981), Chapter 5 for details of liability of auditors to clients) and decide to go to court. When sued in court, auditors are found liable with a probability γ and fined an amount α if the state is truly bad and never if the state is good. Alternatively, this assumption can be reinterpreted as stating that ex post, shareholders have access to an independent fourth-party, the court, at no cost (thus, our court plays a similar role to that of the external auditor of Kofman and Lawaree (1993a)). This fourth-party can be quite effective in determining the state of nature (γ can be large). It may thus appear that this is a very attractive method of controlling the monitor. Yet we will show that when shareholders cannot commit not to file a lawsuit and the auditor is risk-averse, the threat of lawsuits may be counter-productive.

Two questions need to be asked at this point. First why not replace the auditor with the court? This alternative may not be feasible because although the court may be quite competent at finding out whether the auditor has misreported or not, it could not undertake all of the auditor's duties. More importantly, investigation by the court is likely to be more expensive than that by the auditor and as we will see, in equilibrium, the court will rarely need to interfere. Thus an arrangement in which the court is the fourth-party is likely to be socially optimal. Second, what happens if the shareholders bear some of the cost of lawsuits? If this cost is small enough, our analysis will go through (but see Corollary 2, below) and if it is high, this will correspond to the case with $\alpha=0$, since the shareholders will never file a lawsuit. In general, if shareholders also observe a signal of the state of nature, they can condition their decision to file a lawsuit upon this signal. Since in our model there is no such signal, costly lawsuits do not enrich the analysis though such an extension looks promising for future work.

As a result of our assumptions, when the auditor discovers the state of the world to be bad but *purposely* reports it to be good, she faces a probability $(1-q_b)\gamma$ of being fined. If she does not discover the state of nature to be bad, she faces the smaller probability $\lambda(1-q_b)\gamma$ that she will be found liable, where $\lambda=1-P(G)=\frac{r(1-p)}{r(1-p)+p}$ is the probability that the state of nature

is bad conditional upon not discovering anything (i.e signal G). We also assume that if the auditor is found liable, the fine α is paid to the shareholders (we thus ignore all costs of legal proceedings- see the discussion above and Corollary 2).

If the shareholders and auditors could write contracts conditional upon the decision of the court, α would not matter at all, since private contracts would increase or reduce it as desired. However, the court considers the global effect on the plaintiff in finding against the defendant. Hence damages would take into account any such pre-existing contracts[6]. We thus assume that the contract of the auditor cannot be made conditional upon whether she has been found guilty or not, but it can be *contingent on final returns* and *on her report*. To analyze the consequences of the legal framework, we will consider two different cases of "misreporting technology";

1) The auditor can misreport in both cases; she can claim that it is the bad state when it is good and good when it is bad, i.e. both a(G)=B and a(B)=G are possible.

2) The auditor can only misreport in the bad state because when she claims the report to be overoptimistic she needs to back this up with evidence, thus only a(B)=G is possible.

Since we will interpret the bribe as a financial one, the funding source of bribe payments may also be important. We will assume that the bribe is paid by the manager and so shareholders will not care about the size of the bribe[7].

a) Case 1: Shareholders can lie in both states

We denote the bonus that the auditor receives for reporting the state of nature to be bad by β (reward to "whistle blowing"). The salary of the auditor when profits of the firm are zero is denoted by s and when the return of the firm is y, this salary is equal to s+z; z is assumed to be non-negative, hence the auditor cannot be paid a lower salary when the firm is successful

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[6] After the filing of a lawsuit, the responsibility of the auditors is potentially criminal, see Gormley (1981) Chapter 14. Also, it is not possible for the auditor and the shareholders to agree to ignore the possibility of lawsuits because shareholders cannot commit not to sue the auditors in the case where the project is unsuccessful.

[7] This also fits well with case in which the manager rewards the auditor in the form of cooperation. However, it is often suggested that actual collusion between the management and auditors takes the form of management consultancy contracts or lucrative fees for other services paid to subsidiaries of the auditing firm (Simunic (1984), Gormley (1981), Chapter 2, p.32). This would however imply that the management is not paying m out of its own resource but is using the company funds. An earlier version showed that all our results hold if we change this assumption, thus m can be interpreted as coming out of shareholders' resources.

(for instance, because the auditor and the manager can hide the returns). We are also ignoring any bankruptcy constraints that may be binding the firm or the auditor; the firm is assumed to have sufficient reserves to pay the auditor and the auditor is able to meet the fine imposed on her by the court. Finally, we assume that the manager makes a take-it-or-leave-it side-contract offer to the auditor.

The first constraint that needs to hold is a truth-telling one, (A1). This makes sure that the auditor tells the truth in the bad state, i.e. a(B)=B. If she claims the state to be bad, she will receive $s+\beta$. If she claims the state to be good, the project will go ahead, and she will receive her basic salary s plus a bribe that can be as large as m. Also with probability q_b the project will be successful and she will get an additional bonus z. However, with probability $(1-q_b)$, the project will be unsuccessful and with probability γ she will get detected to have misreported and will be fined α. Therefore, for a(B)=B, we require

(A1) $$u(s+\beta) \geq q_b u(s+m+z)+(1-q_b)(1-\gamma)u(s+m)+(1-q_b)\gamma u(s+m-\alpha)$$

Secondly we need a truth-telling constraint when the auditor's signal is G, i.e. when she does not discover any signs of overoptimistic reporting by the management. In this case, the project may still be bad with probability λ and she will be fined α with probability $\lambda(1-q_b)\gamma$. Also conditional on her signal G, she will get the bonus with a total probability of $(1-\lambda)q_g+\lambda q_b$. Thus for a(G)=G, we require

(A2) $$u(s+\beta) \leq \{(1-\lambda)q_g+\lambda q_b\}u(s+m+z) + \{(1-\lambda)(1-q_g)+\lambda(1-q_b)(1-\gamma)\}u(s+m)+\lambda(1-q_b)\gamma u(s+m-\alpha)$$

Next we need to write down the participation constraint of the auditor. This requires her expected utility to be greater than her reservation return, u*. With probability (1-p)(1-r), the state of nature will be bad; in this state there is not a sufficiently large bribe to make the auditor lie (i.e. (A1) holds), thus she will tell the truth and receive $u(s+\beta)$. With probability $p+(1-p)r$, she will not discover any signs of the bad state and she can be bribed. However, as the manager is making a take-it-or-leave-it offer, he can just offer her alternative return, $u(s+\beta)$. Therefore, the participation constraint is

(PC) $$u(s+\beta) \geq u^*$$

Shareholders would like to offer a contract to the auditor which satisfies all these three conditions and minimizes their total cost;

$$TC=s+(1-p)(1-r)\beta+\{pq_g+(1-p)rq_g\}z-(1-p)r(1-q_b)\gamma\alpha$$

Shareholders only pay β when the auditor claims the state to be bad. Also note that the auditor is paying α back to the shareholders with probability $(1-p)r(1-q_b)$ (since in equilibrium, the auditor will be truthful, this is the probability that she will be fined conditional upon her telling the truth) and the expectation of this amount is subtracted from the total cost above. When the auditor claims the state of nature to be good, she is receiving part of her payment from the management in the form of bribes. This implies that shareholders are happy in equilibrium for the auditor to receive bribes from the management and thus to relinquish her full independence. However, in the equilibrium of this static problem, the auditor will never conceal any evidence. We can now ask whether z will be set different from zero, or in other words, whether the auditor's salary will be conditioned upon the performance of the firm.

Proposition 2 (Case 1: Auditor Fees Are Independent of Firm Performance)
When the auditor can misreport in both states, her payment is not conditioned on the performance of the firm.

In this set-up increasing z has two effects. First, a direct negative effect as costs increase but also a beneficial indirect effect since increasing z would push up the RHS of (A2), thus enabling a reduction in s and a rise in β. In the appendix, we show that the indirect effect never dominates the direct effect and profit-maximizing shareholders never relate the salary of the auditor to the performance of the firm. This result is also quite intuitive. An increase in z, compared to an increase in β, introduces additional variability in the auditor's return because conditioning on her information, the performance of the firm is still uncertain. However, the auditor is receiving her reservation return and the manager is paying all his resources in the form of bribes irrespective of the value of z (i.e. (A2) holds as an equality), therefore, the shareholders must be bearing the cost. We can also see that if it were possible, the shareholders would prefer $z<0$ and a correspondingly higher value of s as long as $\alpha>0$. Because this corresponds to providing insurance to the auditor in the event of her being fined, it would reduce total costs to shareholders. However when $\alpha=0$, the optimal value of z is zero even when it can be chosen to be negative (see equations (5)-(6) in the appendix).

Next we turn to the interaction between the "stick" imposed by the legal structure, α, and the "carrot", β, (having already established that the other type of carrot, z, will not be used). We will show that in this case, total costs to shareholders are increasing in α, implying that the

ex post possibility of lawsuits makes shareholders worse-off.

Proposition 3 (Case 1: Possibility of Litigation is Harmful)
When the auditor can lie in both states, total costs, TC, are everywhere increasing in α.

The proof is provided in the appendix. An increase in α has two effects: a direct effect that reduces the cost to shareholders as they receive α from the auditor and an indirect effect that as α goes up, the RHS of (A2) falls thus β needs to be reduced. In the appendix, we demonstrate that this time, the indirect effect always dominates the direct effect. The intuition is again that the manager and the auditor are as well off as before and an increase in α increases the variability of the auditor's return in the good state; shareholders have to bear this cost. We have therefore shown that, of the three instruments available to control the auditor, α, β and z, the cheapest way to achieve control is to use β only. Thus if shareholders were to set α by means of a private contract, they would choose $\alpha=0$ (despite the fact that γ can be as large as 1) because bonuses induce the auditor to report her information without introducing as much variability in her return. However, when α is set at a positive level by law, they cannot commit not to file a lawsuit ex post, and the auditor demands more compensation ex ante.

b) Case 2: The Auditor can only lie in the bad state

We now turn to the case in which the auditor needs to furnish evidence of actual over-optimistic reporting by the manager and thus cannot claim the state to be bad unless she finds such evidence. Hence irrespective of her rewards, the auditor will report truthfully if her signal is G, i.e. a(G)=G. Therefore, the only incentive we need to give to the auditor is for her not to hide such evidence when the state of nature is indeed bad. (A2) now becomes irrelevant and we are only left with (A1). Crucially, the participation constraint of the auditor will change too because she no longer receives u(s+β) in both states. Instead when her signal is good, she will receive her payoff specified by the contract. Also since (A1) holds, she will never receive any bribes in equilibrium. Thus

$$(PC') \qquad \begin{aligned} &(1-p)(1-r)u(s+\beta)+\{pq_g+(1-p)rq_b\}u(s+z) \\ &+\{p(1-q_g)+(1-p)r(1-q_b)(1-\gamma)\}u(s)+(1-p)r(1-q_b)\gamma u(s-\alpha)\geq u* \end{aligned}$$

Proposition 4 (Case 2: The Possibility of Litigation Is Not Always Harmful)
When the auditor can only lie in the bad state, there exists an intermediate value of legal liability which minimizes total costs.

To see why it would never be optimal to pay the auditor more than her reservation return is straightforward[8]. Also, cost minimization requires (A1) to be satisfied as an equality. In the appendix, we analyze how β and s vary as α tends to infinity and z is set equal to zero. We see that high values of α are harmful as in the previous subsection. However, as α tends to zero, total costs are also shown to decrease in α. The intuition can be obtained by comparing (PC) and (PC'). Before β was a sure payment to the auditor and increasing β was a relatively cheap way of compensating the auditor for her services. However, here, the auditor only receives β with probability (1-p)(1-r). When α is equal to zero, β has to be set high in order to satisfy (A1); this introduces too much risk. On the other hand, when α increases, her return becomes more variable but *by virtue of the risk-aversion of the auditor* (i.e. concavity of u(.)), this also allows a reduction in β which, at low values of α, is beneficial. Therefore in this case, it is not optimal to rely on one instrument too much and there exists an optimal level of α. By the same argument, it may also be optimal to have z different from zero, but α would still be positive.

Two immediate corollaries to this discussion can also be stated (proofs omitted);

Corollary 1:
If the auditor is risk-neutral any level of α is efficient. Further β and z are equally effective.

The intuition of this corollary relies on the discussion of the main results of this section. A high level of α reduces the auditor's return in one state of nature and the auditor needs to be compensated for it. However, since α is paid back to the shareholders, when both sides are risk-neutral the size of α does not matter. Similarly, the reason why z was less efficient than β was that *conditional upon the information of the auditor*, z introduced more variability than β. Yet when risk-aversion is not an issue, the two types of bonuses are equally effective.

Since there is no issue of the auditor having limited resources, we finally have (see

[8] This is not always the case, paying a third-party more than her reservation return may be necessary to avoid collusion when the third-party has limited resources (e.g. Acemoglu (1993), Besley and McLaren (1993)).

Kofman and Lawaree (1993a) for a similar result in a slightly different context);

Corollary 2:

It is always more costly to use non-pecuniary punishments rather than pecuniary ones.

Thus if additional to α, there are litigation expenses and costs to applying to court, legal punishment becomes a less attractive method of control, even without risk-neutrality (on this also see Acemoglu and Gietzmann (1993)). Since in practice legal costs are quite substantial, the legal stick is even less attractive than suggested by our analysis above.

The implication of this section is that in a hierarchical organization form, it may be optimal to pay the monitor a salary independent of the outcome ($z=\alpha=0$), just rewarding her conditional upon her report, because, *in equilibrium, her report is a more accurate signal of her information* (which we want to deduce) *than the performance of the firm*[9]. We have also showed that depending on the precise assumptions, there may be a limited role for legal liability of the monitor (auditor) and if this is the case, legal liability should be set neither too high nor too low. In practice, we seldom observe monitors being rewarded according to the performance of the agent. Our analysis thus suggests a possible explanation for this. However, the rest of the predictions of this model are not as plausible; although rewards to "whistle-blowing" may exist, monitors are not often paid according to their reports). It can be argued that, especially in the case of auditors, their reputation thus their future payments will depend on how tough they appear, hence indirectly on their reports. Yet casual observation as well as established views (e.g. Gormley (1981), Dunn (1991)) also suggest that the legal stick is important in controlling the monitors and a static model does not fit this observation very well. This discrepancy between the model and the practice may have a number of different sources. First, the legal arrangements we observe may be inefficient. Second, report contingent pay-offs may not be possible. Third, a static model with unrestricted side contracts may not be capturing the salient features of the situation. Motivated by this last observation, we next turn to a dynamic model in which we will try to open the black-box of collusion and analyze its predictions on whether it is optimal to give monitors direct incentives. Further as we will see, a model of implicit collusion will enable us

[9] Strictly speaking, when $z=\alpha=0$, the auditor will be indifferent between telling the truth and lying. In this case we assume that she behaves as we want her to. Alternatively, z or α can be marginally positive.

to offer some tentative answers to the questions posed in the introduction on which the static model was silent.

4) Implicit Collusion and Auditor Behavior

The previous section has a major omission: there will often exist legal limits to the side-contracts that can be written between the manager and the auditor and as a result enforceability problems associated with these side deals will also be quite serious. For instance in our example of auditing, all transactions between the auditor and the management are closely monitored by regulatory agencies (e.g. SEC and AICPA in the US, see Gormley (1981), Chapters 2, 5 and 13). This leads us to ask the following question; suppose there is no possibility of side-contracting via direct financial transfers between the manager and the auditor, is collusion still possible? If the answer is yes, we refer to this as *implicit collusion*. There is nothing that forces the auditor to collude; but along the equilibrium path, the auditor suppresses some information in order to increase her payoff. This, rather than a situation in which auditors receive explicit bribes, also seems to be more in line with the view among lawyers, accountants and sociologists about the imperfectness of the independence of the auditor and, in general, of monitors (see references in footnote 2). We will investigate the circumstances under which such implicit collusion can arise. Our analysis will suggest a number of conditions;

(4.1) A long-term relationship must exist between the auditor and the manager.

(4.2) The manager should have a credible threat to fire the auditor.

(4.3) The firing of the auditor should not be interpreted by the shareholders as sufficient proof that the project is bad - this will require that auditors have a secondary role in which they can fail. And/or there should be a positive probability that the next auditor who is hired does not find out about the state of affairs or is willing to cooperate with the management.

(4.4) The threat of being fired should be damaging to the first auditor so that she is willing to collude implicitly in order to avoid being fired. In other words, the first auditor should be expecting some positive rents in future periods.

When such collusion is possible, it can again be prevented by the threat of litigation or by an appropriate incentive scheme for the auditor. We will see that the role of the litigation threat is now different and the "stick" is much more effective relative to the "carrot" than in the previous section.

To model this situation in the simplest way, we maintain the basic structure set up in

section 2 but also introduce some new features. Firstly, we now need a dynamic framework and thus assume that the firm is infinitely lived in discrete time and consists of a number of projects. We are interested in one of these. Shareholders are not sure about the probability of success of this project. On the other hand, the manager is again assumed to be an absolute empire-builder and whatever the cost, he always wants to continue with this project for as long as possible. Unconditionally, the project is good with probability p and bad with probability 1-p and when the returns are realized, a good project has probability q_g of success while this is q_b for a bad project. We thus have a structure very similar to the static model. However, it is uncertain when the project will yield its return. In particular, in each period there is a probability θ that the project will come to an end and yield its final return. Because the manager never wants to abandon this project, shareholders cannot induce him to report truthfully and the auditor can again be useful. In this game both the auditor and the shareholders discount the future at the rate δ. Due to discounting we also need to modify assumptions (C1) and (C2). Namely

(C3) $$\frac{\theta}{1-\delta(1-\theta)}q_g y > L > \frac{\theta}{1-\delta(1-\theta)}q_b y$$

Thus the expected net present value of a good project is higher than the liquidation value but that of a bad project is less.

(C4) $$\{pq_g+(1-p)q_b\}\frac{\theta}{1-\delta(1-\theta)}y > L$$

This condition states that unconditionally, the project is on average profitable.

Since the firm consists of a number of projects, it needs to have an auditor employed all the time and this auditor will also issue a statement each period reporting whether the manager is overoptimistic about the project in question. Here we make a number of additional assumptions, which will be discussed in more detail as we go along. First, the firm faces switching costs in the audit market, thus pays a fee higher than the marginal cost of auditing. In particular, each period, the auditor receives a minimum payment (rent) of R above its marginal cost. Second, there is a small probability ϵ that the auditor will fail in her duties associated with other projects. Yet these duties are quite important (e.g. internal fraud detection, see Gormley (1981), Chapter 3.7) and if the auditor fails in these duties, she needs to be replaced. Whether she has done so or not is unobservable by the shareholders, thus authority over the auditor is delegated to the manager. When the auditor is dismissed a new auditor is hired in the following period. We will later analyze how the results change if the new auditor

is brought immediately. Third, the auditor is now assumed to be risk-neutral. As argued above, risk-aversion introduces important effects. However, it also complicates the analysis and is not crucial for the mechanisms we are investigating here. Finally, the auditor always observes the true state (i.e. r=0) but she obtains two kinds of evidence; with probability μ hard and with probability $1-\mu$ soft evidence. Hard evidence is verifiable and the auditor is unable to conceal it[10]. Soft evidence in contrast is unverifiable by the shareholders; the auditor may choose not to report it and if she reports it, she cannot prove it to the shareholders using hard facts; it will just be her opinion[11]. However, if the auditor conceals her soft evidence and the project fails, she is again found out to be guilty and fined an amount α with probability γ. For simplicity, we also assume that whether the evidence is hard or soft is an independent event from whether the auditor failed in her other duties. Figure 2 summarizes the sequence of events in this game (for brevity ignoring the failure and success of the auditor in the other tasks). Thus there now exist three possible reports for the auditor: good, G; bad with soft evidence, BS and bad with hard evidence, BH. First, a(BH)=BH is true by definition. We will use the term *implicit collusion* to describe the case in which a(BS)=G. Each period, shareholders observe the auditor's report (G, BS or BH) and whether the auditor has been discharged by the management or not and decide whether to continue with the project. Since we are also assuming that side-contracts cannot be written between the auditor and the manager, implicit collusion is the only type of collusion that is possible and we will investigate under what circumstances it may arise.

The situation we are considering now corresponds to a dynamic game with incomplete information and we use the concept of Perfect Bayesian Equilibrium. According to this equilibrium concept, shareholders' beliefs must be derived from the equilibrium strategies of the manager and the auditor by Bayes' rule and at each stage of the game, given these beliefs, the

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[10] As we will see later, the auditor will only conceal not to be discharged by the manager. Therefore even if she had the possibility of concealing hard evidence, she would never do so. Thus our assumption that hard evidence cannot be concealed is purely to simplify the discussion in the text.

[11] The assumption that r=0 only serves to simplify the expressions that will follow. However, the distinction between soft and hard information is more substantive. If we only had hard information, the manager would not find it profitable to fire the auditor and thus would not have a credible threat. If we only had soft information, the shareholders would be less willing to tolerate collusion. The distinction between soft and hard evidence is made by Antle (1984), Tirole (1986) and Jewitt (1992) among others, but none of these papers discusses the interplay between non-verifiability of information and collusion via career concerns.

strategies of each player must be best-response to the strategies of other players. Also the equilibria of this model satisfy stronger equilibrium concepts such as Cho and Kreps (1987)'s Intuitive Criterion.

The first thing to note is that irrespective of whether the project in question continues or not[12], the auditor is expecting future rents, R per period, from being employed by this firm. Thus the auditor wants to be reemployed or in other words, she has *career concerns*. Also note that the manager has the right to fire her claiming that she failed in her other duties. Therefore if the threat of the manager to fire the auditor is credible, he will have some scope in forcing her to report in the way he desires. This credibility will depend on whether the auditor's dismissal is interpreted by the shareholders as a bad signal about the quality of the firm. Provided that this threat is credible, the auditor will compare the return to collusion with the return to being honest and getting fired. If she prefers the former, we will have an *implicit collusion equilibrium* where auditors conceal their soft information and managers fire auditors who refuse to collude. The alternative is a *no collusion equilibrium* where auditors always report truthfully. Our strategy of analysis in the rest of this section is to derive conditions for an implicit collusion equilibrium to exist and then globally characterize the equilibria of this game. As we will see, the behavior of the auditor may depend on the structure of audit market and the behavior of other auditors. We will first suppose that all auditors are believed to implicitly collude (i.e. a(BS)=G).

Proposition 5 (Optimal Continuation With Implicit Collusion)
In the equilibrium in which auditors implicitly collude, the project is never abandoned until an auditor provides hard evidence that it is bad.

Our first result states that when auditors are believed to implicitly collude, the dismissal of an auditor is not interpreted as a bad signal which will in turn make the threat of the manager a credible one. The proof of this proposition is again in the appendix. Yet, the underlying idea is sufficiently important to deserve discussion in the main text: even if the manager keeps firing auditors, this is not interpreted as a bad signal and the project is not

[12] In general, the auditor would receive less rents when one of her projects is abandoned which could increase her incentives to implicitly collude.

abandoned. In an equilibrium in which auditors are expected to collude, they are never fired for not colluding. Therefore, all firings are interpreted as due to auditor incompetence and do not constitute bad signals. If an auditor has no hard evidence but is fired because of incompetence, it would be no use for her to claim so because she only has non-verifiable soft evidence and all auditors who are actually fired for incompetence would also have a similar incentive and thus in equilibrium they will not be believed unless they possess hard evidence. In other words, denoting failure by the auditor in assisting the manager by F and no failure by S; in the implicit collusion equilibrium, $a(G,F)=a(BS,F)=BS$ and $a(G,S)=a(BS,S)=G$. Thus if an auditor deviates and sends message BS when her signal is BS and the manager fires her, this will be interpreted as $a(.,F)=BS$. As a result, in the implicit collusion equilibrium, soft information does not adversely affect shareholders' beliefs. Since this result is very much dependent on the secondary role of the auditor (condition (4.3)), collusion will be more difficult when the scope of the responsibilities of the auditor is narrowly defined. In our simple example of this section, collusion can be prevented if the secondary duties of the auditor are delegated to another party (e.g. employ another auditing firm for the other projects)[13]. Also, if the manager does not have the authority to fire the auditor, the auditor will have weaker career concerns and thus will have less incentive to collude. In our model, the manager is assumed to have the right to fire the auditor because shareholders cannot observe her performance. But in general, the principal should prefer not to make the monitor the agent's subordinate. In fact, in most hierarchical organizations, although the agent can always complain about the monitor, the monitors are not under the direct control of the agent and have higher authority than the people they supervise[14]. In a model with unrestricted contracting, there is no reason to expect such an arrangement.

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[13] If $\epsilon=0$, implicit collusion would still be an Perfect Bayesian Equilibrium but would fail the Intuitive Criterion or any other refinement of PBE. Also obviously, other sources of noise will lead to a similar result. But our general claim, that the narrower is the scope of the monitor, the smaller is this noise and thus the more difficult is collusion, would hold.

[14] See Corzier (1964, pp 42-43) about how the relationships between the agent and the supervisor varies depending on how much authority the supervisor has. Felli (1993) offers a different interpretation of Corzier's discussion. In Felli's model, when the supervisor has more authority, the agent is less willing to reveal her private information, thus collusion is more difficult. Whereas in our model more authority insulates the supervisor from the influence of the agent.

Proposition 6 (Managerial Behavior With Implicit Collusion)
In the implicit collusion equilibrium, when the project is bad, the manager will always fire an auditor who does not collude and does not possess hard evidence.

The proof of this proposition is straightforward and is thus omitted. The inference of the shareholders described above implies that the manager will find it profitable to fire an auditor who deviates. If he does not fire her, the project is abandoned. If he fires the auditor, this is interpreted by the shareholders as due to auditor incompetence and their posterior is not changed (see proof of Proposition 5) and the project is not abandoned. Moreover, since we are in the implicit collusion equilibrium, the next auditor is expected to collude (again condition (4.3)). Therefore, the manager will be better off by firing a deviant auditor.

Having established that the manager has a credible threat to fire the auditor, we need to see whether the auditor would prefer to implicitly collude rather than to be fired. The incentive to collude will again depend on the carrot and the stick facing the auditor. We also know that two kinds of carrots are possible; report contingent bonuses, β, and profit contingent bonuses, z. In the previous section these two instruments differed as they differentially affected the variability of the auditor's returns. Since the auditor is now risk-neutral, both instruments are equally effective (Corollary 1) and we can just concentrate on the case in which only β is used.

Proposition 7 (Incentives To Collude)
When the manager's threat to fire is credible and the information is soft, the auditor will prefer to implicitly collude iff

(I1) $$R \geq \frac{\{1-\delta(1-\epsilon)\}\{\theta(1-q_b)\gamma\alpha+(1-\delta(1-\theta)(1-\mu)(1-\epsilon))\beta\}}{1-\delta(1-\theta)(1-\mu)(1-\epsilon)}$$

Obviously the most preferred outcome for the auditor is to be truthful thus avoid the possibility of a lawsuit and still receive the future rents. However, when we are in an implicit collusion equilibrium, the auditor will get fired when she refuses to collude. Thus being honest costs her the rents. However, in return she avoids the possibility of being found guilty in the court (α) and receives the bonus β. Proof of Proposition 7 in the appendix compares these costs

and benefits and derives condition (I1)[15]. Note an important feature of (I1), that is shared by other conditions we will derive; the larger is R, the more likely is the auditor to collude because the cost of not colluding in terms of future forgone benefits is greater (condition (4.4)). Since a market with a lower R can be interpreted as more competitive, this result implies that the more competitive is the audit market, the more difficult is collusion. This proposition thus establishes an important link between the conditions of the market and organizational form: the implicit collusion concerns become much more important in a hierarchical organization form when the monitor has market power which gives her strong career concerns (in this claim, we are ignoring the fact that it may be more difficult to fire an auditor with market power, e.g. a complete monopolist).

We can however see that the RHS of (I1) depends on β. By choosing β large enough, shareholders can ensure that (I1) does not hold and thus implicit collusion does not take place. Next we will show that depending on the values of α and R, it may be too expensive to use this "carrot" strategy and that, as we often observe in practice, it may be optimal to pay a flat fee to the auditor rather than giving her direct incentives.

Proposition 8 (No Contingent Fees With Implicit Collusion)

If

$$R \geq \frac{\{1-\delta(1-\epsilon)\}\{1-\mu-\delta(1-\mu)(1-\theta)\}L}{1-\delta(1-\mu)(1-\theta)} - \frac{\{1-\delta(1-\epsilon)\}\{(1-\mu)\theta q_b y\}}{1-\delta(1-\mu)(1-\theta)} + \frac{\{(1-\delta(1-\epsilon)\}\{\mu(1-\delta(1-\mu)(1-\theta))-\delta(1-\mu)^2(1-\theta)\epsilon\}\theta(1-q_b)\gamma\alpha}{\{1-\delta(1-\mu)(1-\theta)\}\{1-\delta(1-\mu)(1-\theta)(1-\epsilon)\}} \quad \text{(I2)}$$

then it is optimal for the shareholders to set $\beta=0$ and pay a flat fee to the auditor.

The proof of this proposition is again in the appendix. The intuition is that, in order to ensure that the auditor does not collude (i.e. that (I1) is not satisfied), there is a minimum value of β that is required. However, paying this may be too expensive for the shareholders. This is again related to the fact that, because of the switching cost (i.e. non-competitive forces in the audit market), the auditor is receiving a minimum payment, R, in all states. An increase in β

[15] It is assumed that if the auditor reports G and later she discovers hard evidence and reports it, she suffers no punishment.

constitutes an additional payment; in contrast to the previous section where s was reduced as β went up, here the auditor will be paid R and R+β depending on her report (since she can always extract R from the firm)[16]. As a result, it may be too expensive to use bonuses to control collusion. Thus shareholders may be content with less than full auditor independence and in contrast to the previous section, in equilibrium, this compromise leads to some relevant information not being transmitted to the shareholders. Kofman and Lawaree (1993b) also derive the result that it may be optimal to allow some collusion. However in their model differently from ours, some auditors are naturally honest and it may thus be profitable not to incur the costs of preventing collusion.

Proposition 8 establishes condition (I2) which shows when it will be more expensive to prevent implicit collusion. Nevertheless, the presence of implicit collusion does not imply that auditing is useless. First, we have assumed that the other services offered by the auditor are essential. Second, even when the auditor implicitly colludes, she reveals the quality of the project with probability μ. When (I2) is satisfied, shareholders would like to set $\beta=0$ thus are willing to tolerate some degree of collusion despite the fact that they can prevent it by paying a high bonus to the auditors. However, even with $\beta=0$, (I1) may not be satisfied if α is high enough. This is the sense in which legal liability, α, matters in the present model. Thus for implicit collusion to be an equilibrium we require

(I3) $$\alpha \leq \frac{\{1-\delta(1-\theta)(1-\mu)(1-\epsilon)\}}{1-\delta(1-\epsilon)\theta(1-q_b)\gamma} R$$

i.e. (I1) should hold when $\beta=0$. If α is too high, implicit collusion will not be possible. Thus, the legal system needs to be lenient for implicit collusion to take place in equilibrium. We can contrast this result to those of the previous section where, without risk-aversion, α did not matter. The crucial ingredient in the argument of section 3 was the participation constraint of the auditor. Before shareholders had to increase the payment of the auditor to compensate her for the possibility of high fines. When both parties are risk-neutral, such transfers do not matter at all. However here, the auditor is receiving rents equal to R per period. Thus a small increase in α does not mean that shareholders have to pay the auditor more, because she is already receiving more than her reservation return. Although increasing β is not always beneficial

[16] Similarly, if we use performance contingent fees, the auditor will be paid R when the project is unsuccessful and R+z when it is successful and so exactly the same results would go through.

(Proposition 8), increasing α is beneficial to shareholders as long as the auditor is receiving more than her reservation return. It follows that the presence of rents which makes implicit collusion possible, also makes the "stick", α, a relatively more effective method of controlling auditors[17]. Therefore, in contrast to the case of explicit collusion where the auditor received her reservation return, there is now a clear rationale for paying a flat fee and relying on the legal system for disciplining the auditor[18].

We can thus conclude that when both (I2) and (I3) hold, there exists an implicit collusion equilibrium. Because all auditors are expected to collude, dismissals are not interpreted as an opportunistic move by the manager, therefore the manager's threat to fire a deviant auditor is credible. When the legal framework is lenient and the rents expected from continued relationship are high, all auditors prefer to collude in this case and we have an implicit collusion equilibrium. However, is this also the unique equilibrium? The answer is yes.

Proposition 9 (Uniqueness of Implicit Collusion Equilibrium)
When (I2) and (I3) are satisfied, the unique equilibrium is an implicit collusion equilibrium in which all auditors conceal their soft information.

The proof of this proposition is straightforward. The argument above establishes existence. To see uniqueness suppose that (I2) and (I3) hold and that we are not in an implicit collusion equilibrium. What will happen if the manager fires the auditor? Shareholders may interpret this as a bad signal and abandon the project. However, in this case, the manager will have no incentive to fire the auditor for strategic reasons and a dismissal should not be interpreted as a bad signal. Alternatively, shareholders do not interpret it as a bad signal. In this case, the manager would have an incentive to keep firing the auditors in order to prolong the life of the project for as long as he can and hence a firing should be interpreted as a bad signal.

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[17] Increasing α has two benefits; it makes collusion less likely and also reduces total costs to shareholders, whereas β makes collusion less likely but increases total costs. Thus using α is always preferred as long as the auditor is being paid more than her reservation return, which is necessary for implicit collusion (condition (4.4)).

[18] We could obtain similar results in the static contracting problem of the last section, if the auditor could not be paid less than a certain minimum positive amount. However, in contrast to the static problem, in our model of implicit collusion, there are much clearer reasons for the presence of rents and thus for the auditor to be controlled by the legal stick.

Therefore we can see that shareholders must be using mixed strategies, but this means that the project will not be abandoned with probability 1 and the manager will have a credible threat to fire the auditor to keep the project going. It follows that the auditor will prefer to implicitly collude. This result is dependent on the unidimensional preferences of the manager. In general when the manager has smooth preferences, we can see that he too may play mixed strategies. It is a yet unproven conjecture that in such a setting, the higher is ϵ, the higher is the probability of the implicit collusion outcome. If true, this will strengthen our earlier claim that as more tasks are delegated to the auditor and more authority given to the manager, implicit collusion becomes more likely.

We next turn to the case in which (I2) or (I3) does not hold.

Proposition 10 (No Collusion Equilibrium)

If either (I3) or (I2) is not satisfied, there exists a unique non-collusion equilibrium in which auditors do not collude and always report truthfully. If ϵ satisfies

$$\text{(I4)} \qquad p\epsilon\{1-\epsilon\delta(1-\theta)\}\{\frac{\theta}{1-\delta(1-\theta)}q_g y - L\} < (1-p)(1-\mu)\{1-\delta(1-\theta)\}\{L - \frac{\theta}{1-\delta(1-\theta)}q_b y\}$$

a bad project is abandoned immediately. If (I4) is not satisfied, the manager fires the auditor when her information is soft and the project is not immediately abandoned but is discontinued in finite time as all the auditors report their information and get fired.

The proof of this proposition is provided in the appendix, but the argument is quite intuitive. Suppose that the threat of the manager to fire the auditor is still credible. But despite this threat, the auditor will prefer to behave truthfully because either she is receiving a high bonus, (I2), or, the legal punishment is severe enough, (I3). If ϵ is small and satisfies (I4), the project is immediately abandoned after a firing. In contrast, if ϵ is high enough so that (I4) does not hold, the first firing is not interpreted as a sufficiently bad signal and the project is not immediately abandoned. Yet, as auditor after auditor prefers to be fired to collusion, the updated probability that the project is bad falls sufficiently and the project is abandoned in finite time. Thus conditions (I2) and (I3) and Propositions 9 and 10 completely characterize the equilibria of this game.

Despite characterizing the equilibria, our analysis leaves out an important point. In general, the credibility of the manager's threat will depend on the behavior of other auditors

(condition (4.3)). This however does not arise in our analysis, again due to our simplifying assumption that the manager has unidimensional preferences. We can nevertheless capture these effects by letting a new auditor to be introduced immediately after a dismissal rather than next period. We thus need to have the report of an auditor (who is not discharged) before the continuation decision is made by the shareholders. In this case, the credibility of the manager's threat will obviously depend on what this auditor is expected to do. In particular, if the new auditor is believed not to collude with probability 1, there is no point in firing the first auditor. When either (I2) or (I3) do not hold, our analysis will be no different than before. However, when they both hold, auditors will only collude when other auditors are expected to collude.

Proposition 11 (Multiplicity of Equilibria)
When both (I2) and (I3) hold and a new auditor is introduced before the continuation decision, there exist two pure strategy symmetric equilibria; one in which all auditors implicitly collude and one in which no collusion takes place.

The intuition is straightforward, thus the proof is omitted. Auditors most preferred outcome is to tell the truth and they can do this when the manager's threat is not credible because all other auditors behave truthfully too. In contrast, if some of the other auditors are believed to collude, the manager's threat is credible and each auditor prefers to collude implicitly. This result therefore shows that auditor behavior does not only depend on the allocation of authority, legal regulations and market structure but also on the expected behavior of other auditors. This also makes the multiplicity of equilibria different than those encountered in repeated games. Given the strategy of other auditors, the manager and the auditor have unique best responses to each other, however these best responses in turn depend on what other auditors are expected to do.

5) Concluding Remarks

In this paper we studied a simple hierarchical organization and discussed how collusion can arise and how it can be prevented. Section 3 analyzed the case with unrestricted side-contracts between the monitor and the agent. The implication was that although the principal should not pay the monitor according to the performance of the agent, he should still give her direct incentives. We argued that this finding does not adhere well with the practice in which

most monitors are only indirectly controlled by the threat of the law or of being fired, nor is it in line with the conventional view among lawyers, accountants and sociologists about the nature of collusion (e.g. footnote 2). We thus argued that to understand how collusion works, we need to open the black box by modelling collusion in a dynamic context.

Section 4 developed a theory of implicit collusion in which, due to the career concerns of the monitor, collusion takes place without side-contracts. This model predicts that controlling the monitor without direct incentives is often preferable. It also has a number of important implications. The principal may be happy with some valuable information remaining hidden. Collusion is more likely when the market for monitors is non-competitive and thus when the monitor expects high rents from continued relationship and has strong career concerns; also when the monitor has more than one task and when the monitor has less authority. A multiplicity of equilibria with different organizational forms is also possible. Overall this paper argues that although collusion is important, a number of the predictions that follow are not realistic if we interpret collusion as taking place through unrestricted side-contracts. Therefore, the concept of implicit collusion is an important one to analyze; it avoids several of these problems and has better equilibrium foundations.

However, our analysis had number of short-comings, the most important being the assumption that the manager is an absolute empire-builder and wants to continue with the project at all costs. I believe new insights will follow when we relax this assumption which is a task left for future work. It will also be informative to endogenize the allocation of tasks and of authority across agents in such a context since these provide the foundations for implicit collusion. This will also enable us to develop an analysis complementary to that of Felli (1993) where authority and incentives to collude are jointly determined but in a model of implicit collusion rather than one with enforceable contracts.

Figure 1

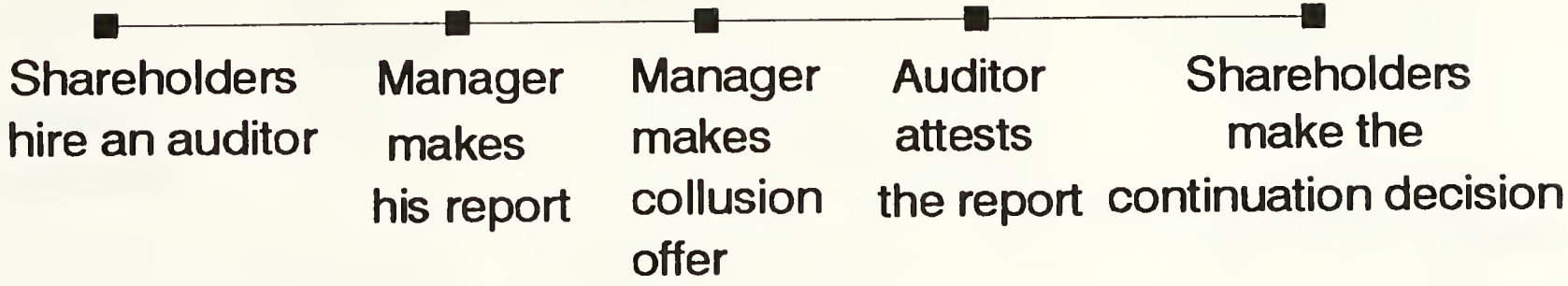
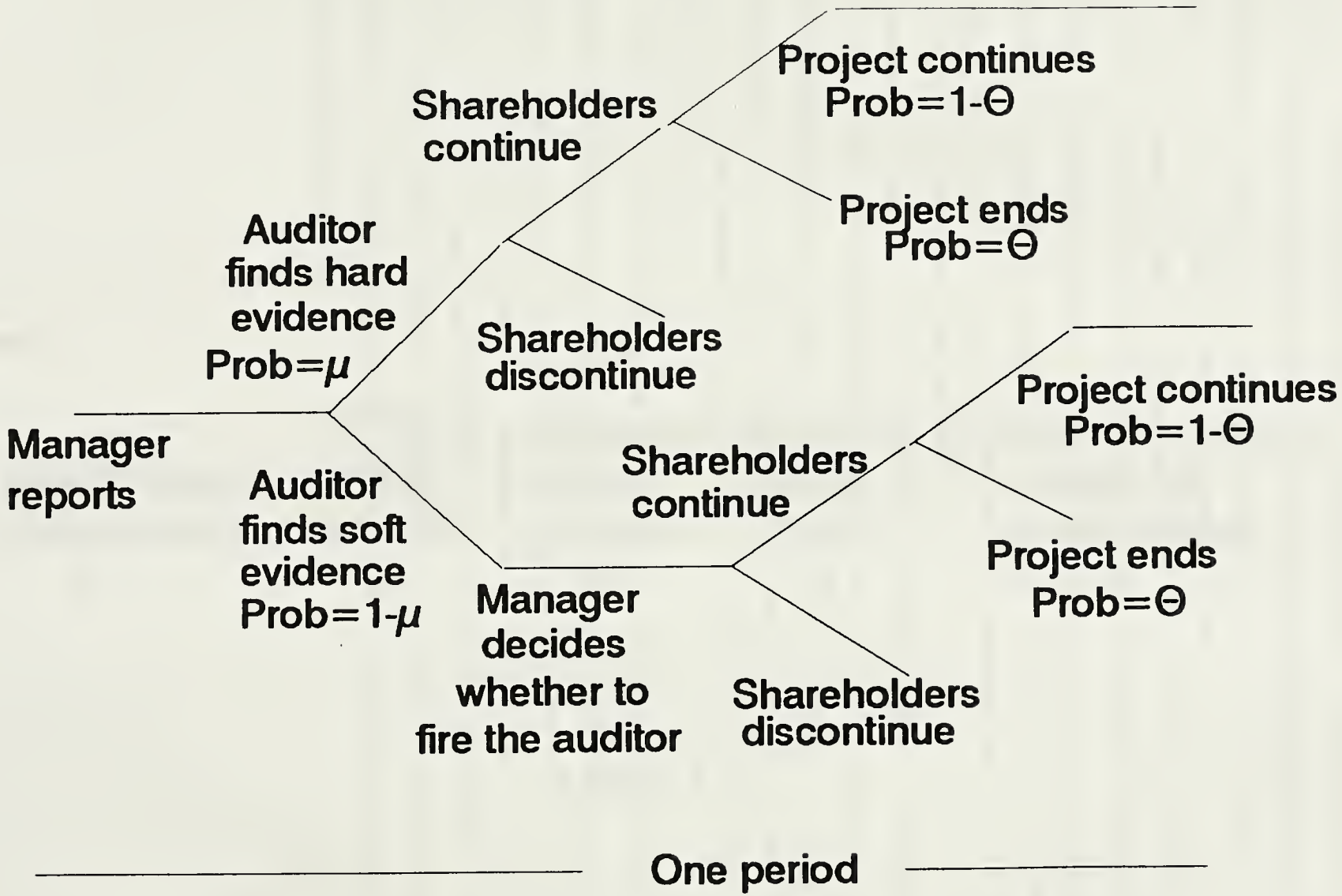

Shareholders hire an auditor
Manager makes his report
Manager makes collusion offer
Auditor attests the report
Shareholders make the continuation decision

Figure 2


Project continues
Prob=1-Θ
Shareholders
continue
Project ends
Prob=Θ
Auditor
finds hard
evidence
Prob=μ
Shareholders
discontinue
Project continues
Prob=1-Θ
Manager
reports
Shareholders
continue
Auditor
finds soft
evidence
Prob=1-μ
Project ends
Prob=Θ
Manager
decides
whether to
fire the auditor
Shareholders
discontinue
One period

Appendix

Proof of Proposition 2:

We can see by direct inspection that (A2) and (PC) would hold as equalities. Differentiate (A2) and (PC) totally evaluate this at z=0, to see how s and β change when we start using z. This will give us the following system

$$\begin{pmatrix} u'(s+\beta)-\{1-\lambda(1-q_b)\gamma\}u'(s+m)-\lambda(1-q_b)\gamma u'(s+m-\alpha) & u'(s+\beta) \\ u'(s+\beta) & u'(s+\beta) \end{pmatrix} \times \begin{pmatrix} ds \\ d\beta \end{pmatrix} = \begin{pmatrix} -\{\lambda q_b+(1-\lambda)q_g\}u'(s+m) \\ 0 \end{pmatrix} dz \tag{1}$$

From this we obtain

$$\frac{d\beta}{dz} = -\frac{ds}{dz} = \frac{\{\lambda q_b+(1-\lambda)q_g\}u'(s+m)}{\{1-\lambda(1-q_b)\gamma\}u'(s+m)+\lambda(1-q_b)\gamma u'(s+m-\alpha)} \tag{2}$$

The change in total costs can be obtained by differentiating TC with respect to z;

$$\frac{dTC}{dz} = -\{(1-p)r+p\}\frac{d\beta}{dz}+\{pq_g+(1-p)rq_b\} \tag{3}$$

Thus

$$\frac{dTC}{dz} = \frac{-\{(1-p)r+p\}\{\lambda q_b+(1-\lambda)q_g\}u'(s+m)}{\{1-\lambda(1-q_b)\gamma\}u'(s+m)+\lambda(1-q_b)\gamma u'(s+m-\alpha)} + \frac{\{pq_g+(1-p)rq_b\}[\{1-\lambda(1-q_b)\gamma\}u'(s+m)+\lambda(1-q_b)\gamma u'(s+m-\alpha)]}{\{1-\lambda(1-q_b)\gamma\}u'(s+m)+\lambda(1-q_b)\gamma u'(s+m-\alpha)} \tag{4}$$

Now noting that

$$\{(1-p)r+p\}\{\lambda q_b+(1-\lambda)q_g\} = pq_g+(1-p)rq_b \tag{5}$$

and that u'(s+m)<u'(s+m-α) by the concavity of u(.), we can write

$$\frac{dTC}{dz} > \{pq_g+(1-p)rq_g\}\{u'(s+m)-u'(s+m)\} = 0 \tag{6}$$

QED

Proof of Proposition 3:

Now set z=0 and totally differentiate (A2) and (PC), this time with respect to s, β and α. The LHS of system (1) will be unchanged and the RHS will now be given by

$$\begin{pmatrix} \lambda(1-q_b)\gamma u'(s+m-\alpha) \\ 0 \end{pmatrix} d\alpha \tag{7}$$

Thus

$$(8)\qquad \frac{ds}{d\alpha} = -\frac{d\beta}{d\alpha} = \frac{\delta(1-q_b)\gamma u'(s+m-\alpha)}{\{1-\delta(1-q_b)\gamma\}u'((s+m)+\delta(1-q_b)\gamma u'(s+m-\alpha)}$$

Change in total cost is given by

$$(9)\qquad \frac{dTC}{d\alpha} = \{p+(1-p)r\}\frac{ds}{d\alpha} - (1-p)r(1-q_b)\gamma$$

$$(10)\qquad \frac{dTC}{d\alpha} = \frac{(1-p)r(1-q_b)\gamma\{1-\lambda(1-q_b)\gamma\}\{u'(s+m-\alpha)-u'(s+m)\}}{\{1-\lambda(1-q_b)\gamma u'(s+m)+\lambda(1-q_b)\gamma u'(s+m-\alpha)} > 0$$

Total costs are thus always increasing in α. Next note that

$$(11)\qquad \lim_{\alpha\to 0}\frac{dTC}{d\alpha} = 0$$

and $\alpha=0$ is optimal from the viewpoint of minimizing the costs of control to shareholders. QED

Proof of Proposition 4:

(We will give the proof for z=0. When z=0, the same effects are present but the expressions become much more complicated.) In this case (A1) and (PC') hold and we can totally differentiate these and obtain

$$(12)\qquad \begin{pmatrix} u'(s+\beta)-\{1-(1-q_b)\gamma\}u'(s+m)-(1-q_b)\gamma u'(s+m-\alpha) & u'(s+\beta) \\ (1-p)(1-r)u'(s+\beta)+\{p+(1-p)r(q_b+(1-q_b)(1-\gamma))\}u'(s) & \\ +(1-p)r(1-q_b)\gamma u'(s-\alpha) & (1-p)(1-r)u'(s+\beta) \end{pmatrix}$$

$$\times\begin{pmatrix} ds \\ d\beta \end{pmatrix} = \begin{pmatrix} -(1-q_b)\gamma u'(s+m-\alpha) \\ (1-p)r(1-q_b)\gamma u'(s-\alpha) \end{pmatrix} d\alpha$$

We would like to show that dTC/dα is negative as α tends to zero. We thus evaluate dβ/dα and ds/dα as α tends to zero.

$$\frac{ds}{d\alpha}=\frac{(1-p)(1-r)(1-q_b)\gamma u'(s+m)u'(s+\beta)+(1-p)r(1-q_b)\gamma u'(s)u'(s+\beta)}{\Delta_0}$$

(13)
$$\frac{d\beta}{d\alpha}=-\frac{(1-p)r(1-q_b)\gamma u'(s)u'(s+\beta)-(1-p)r(1-q_b)\gamma u'(s)u'(s+m)}{\Delta_0}+$$
$$\frac{(1-q_b)(1-p)(1-r)\gamma u'(s+\beta)u'(s+m)+\{p+(1-p)r\}(1-q_b)\gamma u'(s+m)u'(s)}{\Delta_0}$$

where

(14)
$$\Delta_0=(1-p)(1-r)[\{1-(1-q_b)\gamma u'(s+m)+(1-q_b)\gamma u'(s+m-\alpha)\}]u'(s+\beta)$$
$$+[p+(1-p)r\{q_b+(1-q_b)(1-\gamma)\}]u'(s)u'(s+\beta)+(1-p)r(1-q_b)\gamma u'(s-\alpha)u'(s+\beta)$$

Also

(15)
$$\frac{dTC}{d\alpha}=\frac{ds}{d\alpha}+(1-p)(1-r)\frac{d\beta}{d\alpha}-(1-p)r(1-q_b)\gamma$$

Therefore

$$\frac{dTC}{d\alpha}\Big|_{\alpha=0}=\frac{(1-p)(1-r)(1-q_b)\gamma u'(s+m)u'(s+\beta)}{\Delta_0}$$
$$-\frac{(1-p)^2(1-r)^2(1-q_b)\gamma u'(s+\beta)u'(s)}{\Delta_0}+\frac{(1-p)^2(1-r)r(1-q_b)\gamma u'(s)u'(s+m)}{\Delta_0}-$$

(16)
$$\frac{(1-p)^2(1-r)^2(1-q_b)\gamma u'(s+\beta)u'(s+m)}{\Delta_0}-\frac{(1-p)r(1-q_b)\gamma u'(s+m)u'(s)}{\Delta_0}$$
$$-\frac{p(1-q_b)\gamma u'(s+m)u'(s)}{\Delta_0}-\frac{(1-p)^2(1-r)r(1-q_b)\gamma u'(s+m)u'(s+\beta)}{\Delta_0}$$
$$-\frac{(1-p)r(1-q_b)\gamma\{p+(1-p)r\}u'(s+\beta)u'(s)}{\Delta_0}$$

We can now see that this expression, (16), is negative. Firstly remember that the denominator is always positive. Then compare the second term with the third and the last and we can see that these three exactly cancel out. Next compare the fourth term with the sixth and we see that their sum is negative. Finally the sum of the first, fifth and the penultimate terms
is equal to

(17)
$$\frac{(1-p)p(1-q_b)\gamma u'(s+m)u'(s+\beta)}{\Delta_0}$$

Now compare this to the seventh term and noting that u'(s) is greater than u'(s+β) we can see that their sum is negative too and thus (16) is negative which implies that at low values of α,

total costs are decreasing in α.

Next we need to show that at high values of α, total costs are increasing in α. Take a high value of α (tending to infinity). For such a high value of α, (A1) will always hold and thus we can set $\beta=0$. We thus obtain

$$\frac{ds}{d\alpha}=\frac{(1-p)r(1-q_b)\gamma u'(s-\alpha)}{\{1-(1-p)r(1-q_b)\gamma\}u'(s)+(1-p)r(1-q_b)\gamma u'(s-\alpha)} \tag{18}$$

In this case using (15) above,

$$\frac{dTC}{d\alpha}=\frac{(1-p)r(1-q_b)\gamma\{1-(1-p)r(1-q_b)\gamma\}\{u'(s-\alpha)-u'(s)\}}{\{1-(1-p)r(1-q_b)\gamma\}u'(s)+(1-p)r(1-q_b)\gamma)u'(s-\alpha)}>0 \tag{19}$$

as, by the concavity of u(.), u'(s-α) is greater than u'(s).

Finally as dTC/dα is continuous in α, a minimum must exist that is neither too low nor too high. QED

Proof of Proposition 5:

Let us suppose that the auditor is not fired and reports G in the first period. This can be due to two events: first, the project was good which has a probability p (state (G,S)) and second, the project was bad but the auditor did not find any hard evidence so implicitly colluded with the manager (state (BS,S)) which has a probability (1-p)(1-μ). Thus the updated probability that the state of nature is good at time 1 after shareholders observe firing (S) and a report G is given as

$$p_1(G,S)=\frac{p}{p+(1-p)(1-\mu)} \tag{20}$$

Let us now turn to the case where the auditor is fired. In the equilibrium in which auditors are expected to collude, all firings are interpreted as due to auditor incompetence. Thus there are two possible events; the auditor was incompetent and the project was good (state (G,F)) which has a probability ϵp and the auditor was incompetent, the project was bad and the auditor did not find any hard evidence against it (state (BS,F)) - remember that these two events are independent - which has probability ϵ(1-p)(1-μ). Thus

$$p_1(G,F)=\frac{p}{p+(1-p)(1-\mu)} \tag{21}$$

Therefore, p_1 and similarly p_n is not affected at all by whether the auditor is fired or not. Thus as long as there is no hard evidence showing that the project is bad, we have

$$p_n=\frac{p}{p+(1-\mu)^n(1-p)} \tag{22}$$

which is always greater than p. As soon as such hard evidence becomes available, $p_a=0$ and the project is abandoned. QED

Proof of Proposition 7:

We only need to analyze the auditor's decision when the state is bad. If the auditor announces a bad project, she will get an additional payment β. If she conceals this evidence, she will keep on getting R until she fails in her other duties. These rents are thus equivalent to $\frac{R}{1-\delta(1-\epsilon)}$. But also if the project is unsuccessful when it ends, she may have to pay the fine, α which has probability $(1-q_b)\gamma$ every period (starting from this period since the project can end immediately after her favorable report). Thus the net benefit to implicit collusion is

$$\frac{R}{1-\delta(1-\epsilon)}-\frac{\theta(1-q_b)\gamma\alpha}{1-\delta(1-\theta)(1-\mu)(1-\epsilon)} \tag{23}$$

On the other hand, if she is truthful, she receives β but also gets fired. We thus compare (23) to the return to being truthful, β, and obtain condition (I1). QED

Proof of Proposition 8:

We need to compare total costs to shareholders under two scenarios: first, when they pay β so as to avoid collusion, TC_1 and second, when they accept that collusion will take place to some degree, TC_2. As the auditor prefers to report truthfully in the good state, costs in the good state are exactly the same and we just need to compare costs when the state of nature is bad. The cheapest way to avoid collusion is to set β so as to satisfy (I1) as an equality, hence

$$\beta=\max\{0,\frac{R}{1-\delta(1-\epsilon)}-\frac{\theta(1-q_b)\gamma\alpha}{\{1-\delta(1-\theta)(1-\mu)(1-\epsilon)\}}\} \tag{24}$$

When (24) yields $\beta=0$, collusion will not take place anyway (see (I3)), so we can concentrate on the case where (24) is positive. In this case, TC_1 is equal to β, thus

$$TC_1=\frac{\{1-\delta(1-\theta)(1-\mu)(1-\epsilon)\}R-\{1-\delta(1-\epsilon)\}\theta(1-q_b)\gamma\alpha}{\{1-\delta(1-\theta)(1-\mu)(1-\epsilon)\}\{1-\delta(1-\epsilon)\}} \tag{25}$$

In contrast, if the shareholders set $\beta=0$ and let implicit collusion take place, total cost is

$$\begin{aligned} TC_2&=L-(1-\mu)\theta\{q_b y+(1-q_b)\gamma\alpha\}-\mu L \\ &-\delta(1-\mu)^2(1-\theta)\theta\{q_b y+(1-q_b)\gamma\alpha\}-\delta\mu(1-\mu)(1-\theta)L.... \\ TC_2&=L-\frac{\mu}{1-\delta(1-\mu)(1-\theta)}L-(1-\mu)\theta\frac{q_b y+(1-q_b)\gamma\alpha}{1-\delta(1-\mu)(1-\theta)} \end{aligned} \tag{26}$$

The cost is that the liquidation value, L, is not realized. From this we need to subtract expected future revenues. With probability μ, there will be hard evidence and the project will end at no additional cost. With probability $(1-\mu)$, there will be no hard evidence and the project will not be stopped and with probability θ the project will end at the end of this period; with probability

q_b the project will be successful and also with probability $(1-q_b)\gamma$, shareholders will receive compensation from the auditor because the project is unsuccessful and the auditor is found guilty by the court. With probability $(1-\mu)(1-\theta)$ the project will not be stopped nor end, thus we move to the next period where the returns are discounted by δ, and so on. TC_2 will be smaller than TC_1 when (I2) holds. QED

Proposition 11:

Let the subjective the probability that the state is good be ρ. The value of continuing, $V(\rho)$, is

$$V(\rho)=\theta\rho q_g y+\theta(1-\rho)q_b y+(1-\theta)(1-\rho)\mu\delta L$$
$$+\{(1-\theta)(1-\rho)(1-\mu)+(1-\theta)\rho\epsilon\}\delta\max\{V(\frac{\epsilon\rho}{\epsilon\rho+(1-\rho)(1-\mu)});L\}+\delta(1-\theta)\rho(1-\epsilon)\frac{\theta}{1-\delta(1-\theta)}q_g y \quad (27)$$

The project comes to an end with probability θ and it is believed to be good with probability ρ which explains the first two terms. If the state of nature is bad and the project does not end, the auditor will discover hard evidence with probability μ and the shareholders will abandon, receiving L next period. With probability $(1-\mu)$, the auditor will only discover soft evidence, report BS and get fired (a(BS,S)=BS) but also she will report BS and get fired when she fails in her duties and the state is good (a(G,F)=BS). Thus updated probability will be equal to $\frac{\rho\epsilon}{\epsilon\rho+(1-\rho)(1-\mu)}$ and this event will be observed with probability $\{(1-\theta)(1-\rho)(1-\mu)+(1-\theta)\rho\epsilon\}$. After this event, shareholders will decide whether to continue or to liquidate which explains the fourth term. Finally, with probability $(1-\rho)(1-\epsilon)$, it is the good state and the auditor will report this, which gives us the last term. Note that as soon as the auditor reports that the state is good, the project will never be abandoned since in this equilibrium auditors never conceal information, hence the final term is the discounted value of a good project.

We want to find a value of p* which sets (27) equal to L so that shareholders are indifferent between abandoning and continuing. But if $\rho=p^*$ then, $V(\frac{\epsilon\rho}{\epsilon\rho+(1-\rho)(1-\mu)})<L$, and the project will be abandoned yielding L. Substituting this and solving $V(\rho)=L$

$$p^*=\frac{\{1-\delta(1-\theta)\}\{L-\frac{\theta q_b y}{1-\delta(1-\theta)}\}}{\theta(q_g-q_b)y+\delta(1-\epsilon)(1-\theta)\{\frac{\theta q_g y}{1-\delta(1-\theta)}-L\}} \quad (28)$$

If (I4) is satisfied, $\frac{\rho\epsilon}{\epsilon\rho+(1-\rho)(1-\mu)}<p^*$, thus after the first firing, the project will be abandoned. If (I4) is not satisfied, after the first abandoning, $\frac{\rho\epsilon}{\epsilon\rho+(1-\rho)(1-\mu)}>p^*$, but if the project is bad, the auditors will keep getting fired and after a finite time p_n will fall below p* and the project will be abandoned. QED

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